1. **Baseline: 5 methods.**

Robust mixture regression 2.

1. MIXL, MIXT, MIXBI select one.
2. Wei Pan, PRclust R package. Paper <https://www.jmlr.org/papers/volume17/15-553/15-553.pdf> github: <https://github.com/ChongWu-Biostat/prclust> Github has two papers’ link.

Spatial constrained mixture regression 2.

1. SCC (JASA journal, github link <https://github.com/changwn/Supplementary-files-for-SCC>). Paper: SCC method in github.
2. ClustGeo (hierarchical clustering with spatial constraint) R package, github link: <https://cran.r-project.org/web/packages/ClustGeo/vignettes/intro_ClustGeo.html>, paper: <https://arxiv.org/pdf/1707.03897.pdf>
3. Spatialcluster (regionalization with dynamically constrained agglomerative clustering and partition) github + paper: <https://github.com/mpadge/spatialcluster>
4. Spdep (spatial dependence: weighting scheme, statistics) r package: <https://github.com/r-spatial/spdep/>

Image segmentation in computer vision 1.

1. FRGMM (matlab code) <https://sites.google.com/site/nguyen1j/home/10-code>
2. Try to find R/**python** method about image segmentation.
3. Inference tools for Markov Random Fields on lattices: The *R package mrf2d*
4. **Experiments on synthetic data:**

Mixture regression.

K : 2,3,4

N: 100, 500, 1000

Noise level: sigma

Balance: 50/50, 40/60, 30/70

Coefficient : 2 groups

Outliers for robustness.

Regression Outlier: 10%, 20%

Spatial outlier: 5%, 10%

Spatial shape:

Distribution: circle, irregular.

Density of points, outliers (error in center, outside center), spatial outliers.

Diagram

Description automatically generated

1. **Metric:**

Clustering membership.

Rand Index and (ARI)

Outlier detection

Outlier accuracy rate.

Regression model parameters.

include slope and intercept. R square, goodness of fitting.

1. **Ablation experiment.**
2. Remove spatial information
3. Remove error
4. Remove mixture